BUSINESS RULES FOR LATITUDE/LONGITUDE
DATA STANDARD

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CONTENTS

1.0   THE STANDARD

a.   The purpose of the standard is to establish the data infrastructure necessary to allow data
        sharing and secondary use, based on location, thereby promoting the use of EPA's data
        resources for cross-media environmental analyses and management decisions.

b.   This latitude/longitude data standard establishes the requirements for documenting
        latitude and longitude coordinates, and related method, accuracy, and description data
        for places of interest to the Environmental Protection Agency (EPA). Places include
        facilities, sites, monitoring stations, observation points, and other features regulated or
        tracked under Federal environmental programs within the jurisdiction of the EPA.

c.   This standard does not establish a new reporting requirement for the regulated
        community or a new data collection requirement for EPA programs. It does, however,
        require programs that store geographic coordinates to document the method, accuracy,
        and description by which the coordinates were established to provide credibility for the
        coordinates and to allow an assessment of their accuracy.

        Note: The intent of this standard is to ensure that sufficient information is available
               with each set of locational data to enable an assessment of the precision and
               accuracy of that data. This assessment is based on the method, accuracy and
               description information.

2.0   DEFINITIONS

a.   *Latitude* is the measure of the angular distance on a meridian north or south of the
        equator.

b.   *Longitude* is the measure of the angular distance on a meridian east or west of the prime
        meridian.

c.   *Vertical Measure* is the vertical distance in meters either above or below a reference
        surface.

d.   *Accuracy* is the degree of correctness of a quantity or expression.

e.   *Precision* is the degree to which the correctness of a quantity is expressed.

f.   A *Datum* is a single piece of information used as a basis for calculating or measuring.

g. The *Data Standard Steward* for the Latitude/Longitude Data Standard is the person or organization to whom is delegated the responsibility for managing the data resources relevant to EPA's Latitude/Longitude Data Standard.

h. The *Program System Data Stewards* for Latitude/Longitude data are the individuals delegated the responsibility for managing latitude/longitude data for EPA program systems.

i. The EPA *Environmental Data Registry* (EDR) is the central repository and reference tool for Agency data elements and other objects, such as business rules.

j. *Metadata* is data that describes and defines other data. For the purpose of this standard, metadata refers to the data elements for method, accuracy, and description that describe and define the measured horizontal and vertical geographic coordinates.

3.0 APPLICABILITY

a. This standard is applicable to all programs which record locational information as required by the Locational Data Policy (LDP), dated April 8, 1991.

b. This standard applies to both automated and manual information systems. All new and re-engineered information management systems that plan to store locational data are required to include all metadata for documentation.

c. This standard is to be employed by writers of Agency regulations or by persons developing proposed legislation that will result in the collection of locational data.

d. This standard is applicable to Information Collection Requests (ICRs) where program offices have determined that there is a need to collect locational data.

e. This standard is applicable to existing and future information management systems.

f. This standard applies only to point locations. Documentation requirements for linear or polygonal locations are established by the Federal Geographic Data Committee and other Standards Organizations external to the Agency.

4.0   DATA REQUIREMENTS

a.   The following data are mandatory for documenting locational information about features of environmental concern:

- Latitude Measure and Longitude Measure, recorded in degrees and decimal degrees.

- Horizontal Accuracy Measure, recorded in meters. This data element is usually derived, based on the collection method.

- Horizontal Collection Method, reported with standard values for text or code.

- Horizontal Reference Datum, reported with standard values for name or code.

- Reference Point (i.e., the place where coordinates were determined), reported with standard values for text or code.

- Source Map Scale Number, required for all horizontal data collection methods except for methods using Global Positioning System (GPS), reported as a number representing one unit on a map or photo.

b.   The following data are optional for documenting locational information about features of environmental concern:

- Date of Collection (i.e., the date when the coordinates were determined).

- Source of Data (i.e., the group or organization who collected the data), reported with standard values for text or code.

- Comments about the Coordinates, reported with text.

- Verification Method (i.e., the method used to verify the accuracy of the coordinates), reported with standard values for text or code.

- Geometric Type (i.e., Line, Point, Area, Region, or Route), reported with standard values for name or code. This is required for data repositories where more than one geometric type is documented.

- Vertical Measure recorded in meters, in which case the following are required:

  · Vertical Collection Method, reported with standard values for text or code.
  · Vertical Accuracy Measure, recorded in meters.
  · Vertical Datum, reported with standard values for name or code.

c.   Detailed information about the data elements for latitude and longitude and the related method, accuracy, and description that are required to document the location of a place of interest to EPA, including definitions, standard values, and data transfer formats, can be found at the EPA Environmental Data Registry (EDR) web site. http://www.epa.gov/edr/. An overview of the data elements is provided in Appendix A.

d.   Current values of controlled codes and names may be found in the EDR. They are updated as required by changes in methodology and technology.
Note: The current value sets have been changed since the Method Accuracy Description (MAD) Version 6.1 document, dated November 7, 1994.

5.0   PROCESSING

a.   While this standard is not intended to place an additional burden beyond that already imposed by existing EPA policy on program systems and states for collecting locational data, it is recognized that adherence to the Locational Data Policy and recording of these required data items may require additional costs and reporting burden.

b.   Where all locational coordinates for a program are determined by the same source and are based on the same method of collection and reference datum, those common data values may be documented only once with the data set; they are not required to be inserted in each record in the data set.

c.   Program systems can choose to acquire or derive locational data rather than collecting it directly. In fact, acquisition from third parties or from private enterprises will generally result in more consistent quality locational data than can be realized from self reporting.

d.   The preferred Horizontal Collection Method is GPS, since agency policy establishes a 25 meter accuracy goal.

e.   The following rules are preferred for display and presentation of locational data:

1)   Latitude and longitude are measured in degrees and decimal portions of degrees and are recorded according to the measured precision, up to a maximum of six decimal positions.

2)   Where degrees latitude are less than 10 or degrees longitude are less than 100, leading zero(s) must be given (e.g., 09 degrees latitude; 006 or 089 degrees longitude).

3)   For display, latitude measure is always preceded by a plus (+) symbol for points on or north of the equator and a minus (-) symbol for points south of the equator; longitude is always preceded by a minus (-) symbol for points west of the prime meridian and a plus (+) symbol for points on or east of the prime meridian.

4)   Accuracy is always determined in meters and is displayed as plus or minus (+/-) the determined value.

5)   Where a set of latitude and longitude points are recorded to represent a line, area, region, or route, the reference points and the vertical measure, where applicable, must be recorded for each coordinate. Where other metadata for the set of coordinates are identical for each reference point, consideration can be given to storing only one complete set of metadata to represent the collection method, reference datum, data source, accuracy, verification method, collection date, and source map scale number. A complete set of metadata, however, is required for each point for data transfer, as indicated in the following paragraph.

f.   For data transfer the following rules are recommended:

1)   Latitude always precedes longitude, followed by vertical measure, where applicable.

2)   Directional symbols (+/-) must precede measured values for latitude, longitude, and vertical measure, and decimal points must be expressed.

3)   Latitude, longitude, and vertical measure must be transferred with only the number of decimal places that indicate precision.

4) A set of coordinates that represents a point, line, area, route, or region shall include, as a minimum, all mandatory locational data elements for each point in the set.

5) It is acknowledged that there is a wide variety of GIS storage formats. Transfer of locational data may take place in a variety of formats contingent upon identification of that format and at a minimum the mandatory data elements are supported by that format.

6.0 ROLES AND RESPONSIBILITIES

a. The Chief Information Officer (CIO) in conjunction with the EPA Geographic Information Systems (GIS) Workgroup will:

1) Ensure adherence to these business rules and will be responsible for the resolution of conflicts and issues relating to these business rules, including applicability.

2) Provide guidance and technical information to program offices and the regulated community in meeting the requirements of this standard.

3) Ensure the appointment of a Data Standard Steward for Latitude/Longitude Data, distinct from Programmatic Data Stewards. The Data Standard Steward will be responsible for the accuracy, reliability, and currency of the data standard.

4) Maintain a repository of the valid data values for standard codes, names, and text in the Environmental Data Registry.

5) Maintain a central repository of locational data coordinates for places of interest to EPA (i.e., the Locational Reference Tables in Envirofacts).

b. The CIO will be responsible for issuing waivers from compliance with this standard in accordance with the procedures laid out in Section 8 of these business rules.

c. Senior Information Resources Management Officers (SIRMO) and Regional Information Resource Management (IRM) Branch Chiefs will:

1) Promote compliance with this standard.

2) Approve application for waiver from this standard and submit it to the Chief Information Officer.

d. System Program Managers will:

1) Ensure that this standard is implemented as applicable in their systems.

2) Work collaboratively with the CIO on continuing standards development and implementation.

3) Identify and bring forward potential conflicts between these business rules, the underlying standards, and program systems needs.

7.0 IMPLEMENTATION

a. The EDR must contain detailed information about the standard Latitude/Longitude data elements and current value sets.

b. EPA's REI national systems will implement this latitude/longitude data standard and accept new data in the standard latitude/longitude data formats with standard data values no later than February 2002. Other systems will implement this standard when they re-engineer.

8.0 PROVISION FOR WAIVER

a. The Agency's CIO may grant waivers for sufficient reasons.

b. Applications of a waiver shall contain:

5) An outline of the reasons why the data standard should not be implemented.

6) A risk assessment and cost-effectiveness evaluation of continued non-compliant operation.

7) Approval of the decision officials in the requesting office, as defined by EPA's System Life Cycle management policy and by the organizations's SIRMO.

c. The CIO shall notify the applying office in writing of the disposition of the waiver within 60 days of receipt.

9.0   MAINTENANCE

a.   This standard will be reviewed at a minimum of 3-year intervals by the data steward (e.g., to determine the need for updates).

b.   The reviews shall occur more frequently where appropriate, to ensure that the standard remains current with changing technology.

c.   The Data Standard Steward shall submit proposed updates to the Environmental Data Registry for inclusion in the standard.

10.0   REFERENCES

a.   *Chapter 13 - Locational Data, IRM Policy Manual, 2100 Chg 2, 4/8/91.* Agency Catalog of Data Policies and Standards, United States Environmental Protection Agency, Administration and Resources Management, PM-211D, 21M-1019, July 1991.

b.   *Draft Proposed Locational Data Element Definitions and Data Values for the EPA Latitude/Longitude Data Standard*, U.S. Environmental Protection Agency, Office of Information Resources Management, March 4, 1998.

c.   *Geographic Information - Part 11: Spatial referencing by coordinates*, ISO/TC211 N609, November 10, 1998.

d.   *Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy*, Federal Geographic Data Committee (FGDC), FGDC-STD-007.3-1998.

e.   *GIS Technical Memorandum 3, Global Positioning Systems Technology and its Application in Environmental Programs*, United States Environmental Protection Agency, Administration and Resources Management, PM-225, 600-R-92-036, February 1992.

f.   *Locational Data*, IRM Policy Manual, Chapter 13, 2100 Chg 2, April 8, 1991.

g.   *Locational Data Policy Implementation Guidance, Guide to Selecting Latitude/Longitude Collection Methods*, United States Environmental Protection Agency, Administration and Resources Management, PM-211D, 220 B-92-008, March 1992.

h. *Locational Data Policy Implementation Guidance, Guide to the Policy*, United States Environmental Protection Agency, Administration and Resources Management, PM-211D, 220 B-92-008, March 1992.

i. *Method Accuracy Description (MAD) (Version 6.1) Information Coding Standards for the U.S. Environmental Protection Agency's Locational Data Policy*, LDP Sub-Work Group of the Regional GIS Work Group, November 7, 1994.

j. *Representation of Geographic Point Locations for Information Interchange*, American National Standard for Information Systems, ANSI X3.61-1986.

k. *Requirements for Locational Data in the Safe Drinking Water Information System* (SDWIS), EPA 816-R-98-004, August 1998.

l. *Spatial Data Transfer Standard*: FIPS 173-1, U.S. Geological Survey, June 1994.

m. *Standard representation of latitude, longitude and altitude for geographic point locations*, International Standard, ISO 6709-1983(E).

n. *Summary Report of Locational Data Elements for the Latitude/Longitude Data Standard*, SDC-0055-057-KG-7032, May 19, 1998.

APPENDIX A

Standard Data Elements

Standard Data Elements

EDR DATA ELEMENTS	PROPOSED DEFINITIONS	FORMAT	VALUE SET	Names of Data Elements in MAD Codes v. 6.1 (Informational)
MANDATORY				
Latitude Measure (DE 5518:1)	The measure of the angular distance on a meridian north or south of the equator.	A(6) - A(10) +/-DD.dddddd	No	Latitude
Longitude Measure (DE 5520:1)	The measure of the angular distance on a meridian east or west of the prime meridian.	A(7) - A(11) +/-DD.dddddd	No	Longitude
Horizontal Collection Method				Method of collection Text or Code
Horizontal Collection Method Text (DE 5731:1)	The text that describes the method used to determine the latitude and longitude coordinates for a point on the earth.	A(60)	Yes	
Horizontal Collection Method Code (DE 5238:1)	The code that represents the method used to determine the latitude and longitude coordinates for a point on the earth.	A(3)	Yes	
Horizontal Accuracy Measure (DE 5264:1)	The measure of the accuracy (in meters) of the latitude and longitude coordinates.	A(6) in meters	No	Accuracy Value and Unit
Reference Point				Description Category Text or Code
Reference Point Text (DE 5288:1)	The text that identifies the place for which geographic coordinates were established.	A(50)	Yes	
Reference Point Code (DE 5608:1)	The code that represents the place for which geographic coordinates were established.	A(3)	Yes	
Horizontal Reference Datum				Horizontal Datum Name or Code

EDR DATA ELEMENTS	PROPOSED DEFINITIONS	FORMAT	VALUE SET	Names of Data Elements in MAD Codes v. 6.1 (Informational)
Horizontal Reference Datum Name (DE 5292:1)	The name that describes the reference datum used in determining latitude and longitude coordinates.	A(7)	Yes	
Horizontal Reference Datum Code (DE 5308:1)	The code that represents the reference datum used in determining latitude and longitude coordinates.	A(3)	Yes	
Source Map Scale Number (DE 5318:1)	The number that represents the proportional distance on the ground for one unit of measure on the map or photo.	A(9)	No	Source Scale

EDR DATA ELEMENTS	PROPOSED DEFINITIONS	FORMAT	VALUE SET	Names of Data Elements in MAD Codes v. 6.1 (Informational)
OPTIONAL				
Data Collection Date (DE 5296:1)	The calendar date when data were collected.	Date(8) YYYYMMDD	No	Date of Collection
Coordinate Data Source				Source Name or Code
Coordinate Data Source Name (DE 5322:1)	The name of the party responsible for providing the latitude and longitude coordinates.	A(35)	Yes	
Coordinate Data Source Code (DE 5310:1)	The code that represents the party responsible for providing the latitude and longitude coordinates.	A(3)	Yes	
Location Comments Text (DE 5616:1)	The text that provides additional information about the geographic coordinates.	A(150)	No	Description Comments
Vertical Measure (DE 5612:1)	The measure of elevation (i.e. the altitude), in meters, above or below a reference datum.	A(10) in meters	No	Vertical Measure
Vertical Collection Method				Vertical Measure Method of Collection Text or Code

EDR DATA ELEMENTS	PROPOSED DEFINITIONS	FORMAT	VALUE SET	Names of Data Elements in MAD Codes v. 6.1 (Informational)
Vertical Collection Method Text (DE 5326:1)	The text that describes the method used to collect the vertical measure (i.e., the altitude) of a reference point.	A(60)	Yes	
Vertical Collection Method Code (DE 5314:1)	The code that represents the method used to collect the vertical measure (i.e., the altitude) of a reference point.	A(3)	Yes	
Vertical Accuracy Measure (DE 5312:1)	The measure of the accuracy (in meters) of the vertical measure (i.e., the altitude) of a reference point.	A(8) in meters	No	Vertical Measure Accuracy
Vertical Reference Datum				Vertical Datum Name or Code
Vertical Reference Datum Name (DE 5324:1)	The name of the reference datum used to determine the vertical measure (i.e., the altitude).	A(17)	Yes	
Vertical Reference Datum Code (DE 5306:1)	The code that represents the reference datum used to determine the vertical measure (i.e., the altitude).	A(3)	Yes	
Verification Method				Verification Text or Code
Verification Method Text (DE 5737:1)	The text that describes the process used to verify the latitude and longitude coordinates.	A(60)	Yes	

EDR DATA ELEMENTS	PROPOSED DEFINITIONS	FORMAT	VALUE SET	Names of Data Elements in MAD Codes v. 6.1 (Informational)
Verification Method Code (DE 5268:1)	The code that represents the process used to verify the latitude and longitude coordinates.	A(3)	Yes	
Geometric Type				Point-Line-Area Name or Code
Geometric Type Name (DE 5761:1)	The name that identifies the geometric entity represented by one point or a sequence of latitude and longitude points.	A(6)	Yes	
Geometric Type Code (DE 5614:1)	The code that represents the geometric entity represented by one point or a sequence of latitude and longitude points.	A(3)	Yes	